

Contractor or Collaborator	Assay Type	# Assays or Endpoints	References
ACEA Biosciences, Inc.	real-time cell electronic sensing (RT-CES)	1	Xing et al 2006. Microelectronic cell sensor assay for detection of cytotoxicity and prediction of acute toxicity. Toxicol In Vitro 20:995-1004; www.aceabio.com
Attagene, Inc.	transcription factor activities; reporter gene expression	67	US Patent Application 20060160108 Populations of reporter sequences and methods of their use; www.attagene.com
BioSeek Inc.	complex primary human cell-based	87	Berg et al 2006. Characterization of compound mechanisms and secondary activities by BioMAP analysis. J Pharmacol Toxicol Methods 53:67-74; www.bioseekinc.com
Cellumen, Inc.	cellular high content screening (HCS)	11	Giuliano et al 2006. Systems cell biology based on high-content screening. Methods Enzymol 414:601-19; www.cellumen.com
Compound Focus, Inc. / BioFocus DPI	chemical procurement and handling	n/a	www.sbsonline.org/publications/news/issues/2005_12/index.php ; www.biofocus.com
Expression Analysis, Inc.	in vitro genomics; gene expression	>20,000	Shi et al 2006. The MicroArray Quality Control (MAQC) project shows inter- and intraplatform reproducibility of gene expression measurements. Nat Biotechnol. 2006 Sep;24(9):1151-61; www.expressionanalysis.com
In Vitro ADMET Laboratories (IVAL), LLC.	cell culture and co-culture	1	Li AP 2007. Human hepatocytes: isolation, cryopreservation and applications in drug development. Chem Biol Interact 168:16-29; www.invitroadmet.com
NovaScreen Biosciences Corp.	biochemical and cellular high throughput screening (HTS)	240	www.novascreen.com
Phylonix Pharmaceuticals, Inc.	zebrafish developmental toxicity	13	Parng et al 2007. Neurotoxicity assessment using zebrafish. J Pharmacol Toxicol Methods 55:103-112; www.phylonix.com
NIH Chemical Genomics Center	biochemical and cellular high throughput screening (HTS)	>10	Inglese et al 2006. Quantitative high-throughput screening: a titration-based approach that efficiently identifies biological activities in large chemical libraries. Proc Natl Acad Sci USA 103:11473-8; www.ncgc.nih.gov

Contractor or Collaborator	Assay	Species/Cell	Initial Concentrations Screened
ACEA	Real-time cell electronic sensing (RT-CES) providing a kinetic "Cell Index" based on quantitative impedance measurements indicative of cell number, viability, morphology, and cytoskeletal dynamics.	Human lung carcinoma cell line A549	8 point concentration response
ATTAGENE			
Cis	<p>Cis Reporter Transcription Unit (RTU) assays for 43 distinct transcription factors</p> <p>Cell differentiation- HNF6, Tcf4/b-cat, PPR, FoxA, SMADs, Pax, ROR, GLI, GATA, CEBP, RAR, FoxO, Sox, Sp1</p> <p>Cell adhesion- Tcf4/b-cat, NFI, Nf-kB, SMADs, STATs</p> <p>Cell proliferation- SMADS, E2F, c-Myc, p53, Egr-1, Ap1, STATs, Nf-kB, CREB</p> <p>Stress response- p53, Nf-kB, MTF, HSF, Xbp1, HIF1a, Ets, CREB, Egr-1, STATs, PXR</p> <p>Immune response- Nf-kB, IRFs, STATs, Ap1</p> <p>Glucose and lipid homeostasis- PPR, CREB, LXR, SREBP, ROR, CEBP, FXR</p> <p>Oxidative responses- NF-E2, NRF1, HIF1a</p> <p>Adipogenesis- PPR, GR, CREB, CEBP</p> <p>Hematopoiesis- HIF1a, Myb</p> <p>Morphogenesis- NFI, Oct, Pax, Sox, ER, Ap-2</p> <p>Controls- viral promoters (SV40 and CMV) and minimal promoters (TATA-box, Tk-minimal)</p>	Human liver carcinoma cell line HepG2, stably transfected	25 uM
Trans	<p>Trans RTU assays for 24 distinct human nuclear receptors</p> <p>gal4-ERRα Estrogen-related receptor alpha (NR3B1) gal4-PXR Pregnane X receptor (NR1I2) gal4-PPARγ Peroxisome proliferator activated receptor gamma (NR1C3) gal4-RXRβ Retinoid X receptor (NR2B2) gal4-VDR Vitamin D3 receptor (NR1I1) gal4-GR Glucocorticoid receptor (NR3C1) gal4-ERα Estrogen receptor alpha (NR3A1) gal4-ERRγ Estrogen-related receptor gamma (NR3B3) gal4-THRα Thyroid hormone receptor alpha (NR1A1) gal4-GCNF Germ cell nuclear factor 1 (NR6A1) gal4-PPARδ Peroxisome proliferator activated receptor delta (NR1C2) gal4-FXR Farnesoid X-activated receptor (NR1H4) gal4-RARα Retinoic acid receptor alpha (NR1B1) gal4-LXRα Liver X receptor alpha (NR1H3) gal4-LXRβ Liver X receptor beta (NR1H2) gal4-CAR Constitutive androstane receptor (NR1I3) gal4-RXRα Retinoid X receptor alpha (NR2B1)</p>	Human liver carcinoma cell line HepG2, stably transfected	25 uM

gal4-ROR γ RAR-related orphan receptor gamma (NR1F3) gal4-PPAR α Peroxisome proliferator activated receptor alpha (NR1C1) gal4-SF1 Steroidogenic factor-1 (NR5A1) gal4-NURR1 Nur-related protein 1 (NR4A2) gal4-ATF2 Activating transcription factor 2 (ATF2) gal4-ELK1 Ets-like protein-1 (ELK1) gal4-cJun Cellular homolog of v-jun oncogene (JUN)			
BIOSEEK	3C-9, 3 stimuli, 11 endpoints	Primary Human Endothelial cells (HUVEC), passage 4	4 point concentration response
	4H-9, 2 stimuli, 7 endpoints	HUVEC, passage 4	4 point concentration response
	LPS-9, 1 stimuli, 10 endpoints	HUVEC, passage 4; Human Peripheral Blood Mononuclear Cells, unpassaged	4 point concentration response
	SAg-9, 1 stimuli, 9 endpoints	HUVEC, passage 4; Human Peripheral Blood Mononuclear Cells, unpassaged	4 point concentration response
	BE3C-9, 3 stimuli, 9 endpoints	Primary human bronchial epithelial cells, passage 3	4 point concentration response
	BEF4T-9, 2stimuli, 10 endpoints	Primary human bronchial epithelial cells, passage 3; Primary human dermal fibroblasts, passage 5	4 point concentration response
	HDF3CGF-9, 6 stimuli, 11 endpoints	Primary human dermal fibroblasts, passage 5	4 point concentration response
	KF3CT-9, 4 stimuli, 8 endpoints	Primary human primary keratinocytes, passage 3; Primary human dermal fibroblasts, passage 5	4 point concentration response
	HSM3C-9, 3 stimuli, 12 endpoints	HUVEC, passage 4; Primary Human Vascular smooth muscle cells, passage 5	4 point concentration response

CELLUMEN	CellCiphr High Content Screening (HCS) Assay 11 endpoints measured at 3 timepoints, in duplicate: stress pathway activation oxidative stress mitochondrial membrane potential mitochondrial mass cell loss cell cycle DNA degradation nuclear size DNA damage response mitotic arrest cytoskeletal morphology	Human liver carcinoma cell line HepG2	10 point concentration response
		primary rat hepatocyte assay in development	
EXPRESSION ANALYSIS	DNA microarray and PCR based gene expression profiling	Either rat or mouse primary hepatocytes	1 concentration, as high as possible without cytotoxicity
IVAL	IdMOC Cytotoxicity Assay: co-culture of target cell line with and without primary hepatocytes, screening for metabolic activation	Rat or mouse primary hepatocytes, co-cultured with metabolically incompetent cell line	4 point concentration response
		Either rat or mouse primary hepatocytes	1 concentration, as high as possible without cytotoxicity
Primary Hepatocyte Cultures for Genomics			
NOVASCREEN			
P450	Cytochrome P450 1B1	Human	10 uM
	Cytochrome P450 2C8	Human	10 uM
	Cytochrome P450 2C18	Human	10 uM
	Cytochrome P450 2J2	Human	10 uM
	Cytochrome P450 3A5	Human	10 uM
	Cytochrome P450 4F12	Human	10 uM
	Cytochrome P450 2C12	Rat	10 uM
	Cytochrome P450 2C13	Rat	10 uM
	Cytochrome P450 2D1	Rat	10 uM
	Cytochrome P450 2C19	Human	10 uM
	Cytochrome P450 2B6	Human	10 uM
	Cytochrome P450 2E1	Human	10 uM
	Cytochrome P450 1A1	Human	10 uM
	Cytochrome P450 19	Human	10 uM
	Cytochrome P450 2C11	Rat	10 uM

	Cytochrome P450 2E1	Rat	10 uM
	Cytochrome P450 2B1	Rat	10 uM
	Cytochrome P450 2A1	Rat	10 uM
	Cytochrome P450 1A1	Rat	10 uM
	Cytochrome P450 2A2	Rat	10 uM
	Cytochrome P450 3A4	Human	10 uM
	Cytochrome P450 2A6	Human	10 uM
	Cytochrome P450 2C9*1	Human	10 uM
	Cytochrome P450 2D6	Human	10 uM
	Cytochrome P450 1A2	Human	10 uM
	Cytochrome P450 3A1	Rat	10 uM
	Cytochrome P450 3A2	Rat	10 uM
	Cytochrome P450 2C6	Rat	10 uM
	Cytochrome P450 2D2	Rat	10 uM
	Cytochrome P450 1A2	Rat	10 uM
GPCR	Adenosine, A1	Human	25 uM
	Adenosine, A2A	Human	25 uM
	Forskolin	Rat	25 uM
	Adrenergic, Alpha-1A	Rat	25 uM
	Adrenergic, Alpha-1B	Rat	25 uM
	Adrenergic, Alpha-2A	Human	25 uM
	Adrenergic, Alpha-2B	Mouse/Rat	25 uM
	Adrenergic, Alpha-2C	Human	25 uM
	Adrenergic, Beta-1	Human	25 uM
	Adrenergic, Beta-2	Human	25 uM
	Adrenergic, Beta-3	Human	25 uM
	Angiotensin II, subtype 2	Bovine	25 uM
	Atrial Natriuretic Peptide	Guinea Pig	25 uM
	Cholecystokinin A	Mouse	25 uM
	Cholecystokinin B	Mouse	25 uM
	Dopamine, D1	Human	25 uM
	Dopamine, D2s	Human	25 uM
	Dopamine, D4.4	Human	25 uM
	Endothelin A	Human	25 uM
	Galanin, Non-Selective	Rat	25 uM
	Metabotropic Glutamate 1	Rat	25 uM
	Metabotropic Glutamate 5	Rat	25 uM
	Histamine 1	Human	25 uM
	Histamine 2	Guinea Pig	25 uM
	Histamine 3	Rat	25 uM
	LTB4 1	Human	25 uM
	LTB4 2	Human	25 uM
	Muscarinic 1	Human	25 uM
	Muscarinic 2	Human	25 uM
	Muscarinic 3	Human	25 uM
	Muscarinic 4	Human	25 uM
	Muscarinic 5	Human	25 uM
	Neurokinin 1	Rat	25 uM
	Neurokinin 2	Human	25 uM
	Neurokinin 3	Rat	25 uM
	Neuropeptide 1	Human	25 uM

	Neuropeptide 2	Human	25 uM
	Opioid, Delta-2	Human	25 uM
	Opioid, Kappa 1	Guinea Pig	25 uM
	Opioid, Mu	Human	25 uM
	Opioid, subtype non-selective	Rat	25 uM
	Orphanin-1	Human	25 uM
	Platelet Activating Factor	Rabbit	25 uM
	Serotonin 1 Non-Selective	Rat	25 uM
	Serotonin 2A	Human	25 uM
	Serotonin 2C	Porcine	25 uM
	Serotonin 4	Guinea Pig	25 uM
	Serotonin 5A	Human	25 uM
	Serotonin 6	Human	25 uM
	Serotonin 7	Human	25 uM
	Sigma, subtype non-selective	Guinea Pig	25 uM
	Somatostatin, subtype non-selective	Rat	25 uM
	Vasoactive Intestinal Peptide, subtype n	Rat	25 uM
	Vasopressin 1	Human	25 uM
	Adenosine, subtype non-selective	Bovine	25 uM
	Adrenergic, Alpha-1, subtype non-selective	Rat	25 uM
	Adrenergic, Alpha-2, subtype non-selective	Rat	25 uM
	Adrenergic, Beta, subtype non-selective	Rat	25 uM
	Angiotensin II, subtype 1	Human	25 uM
	Bradykinin	Guinea Pig	25 uM
	Complement, Anaphylatoxin	Human	25 uM
	Corticotropin Releasing Factor, subtype	Rat	25 uM
	Dopamine, subtype non-selective	Bovine	25 uM
	Endothelin B	Human	25 uM
	GABA-B	Rat	25 uM
	Gamma-HydroxyButyrate	Rat	25 uM
	Histamine, H1	Human	25 uM
	LTB4	Guinea Pig	25 uM
	LTD4	Guinea Pig	25 uM
	Muscarinic, subtype non-selective, Peripheral	Guinea Pig	25 uM
	Neurotensin	Human	25 uM
	Neuropeptide Y subtype non-selective	Bovine	25 uM
	Opioid, subtype non-selective (+Na+)	Rat	25 uM
	Oxytocin	Rat	25 uM
	Neurotensin	Rat	25 uM
	Purinergic	Human	25 uM
	Serotonin, subtype non-selective	Rat	25 uM
	Thromboxane	Human	25 uM
	Thyrotropin Releasing Factor	Rat	25 uM
	Vasopressin	Human	25 uM
	Aryl hydrocarbon Receptor	Rat	25 uM
Ion Channels	Calcium Type L, (Benzothiazepine site)	Rat	25 uM
	GABA, Non-selective	Rat	25 uM
	GABA-A Benzodiazepine, Alpha-1	Rat	25 uM
	GABA-A Benzodiazepine, Alpha-5	Rat	25 uM
	GABA-A Benzodiazepine, Alpha-6	Rat	25 uM
	Serotonin, 5-HT3	Human	25 uM

	Calcium Channel N	Rat	25 uM
	Glutamate, Kainate	Rat	25 uM
	Glutamate, AMPA	Rat	25 uM
	Glutamate,NMDA MK801	Rat	25 uM
	Nicotinic [α -Bungarotoxin Insensitive, Neu	Human	25 uM
	Benzodiazepine,Peripheral	Rat	25 uM
	Potassium ATP Sensitive	Rat	25 uM
	Potassium Ca2+ Activated, VI	Rat	25 uM
	Benzodiazepine, Peripheral	Human	25 uM
	GABA-A Agonist Site	Bovine	25 uM
	Glycine, Strychnine-sensitive Site	Rat	25 uM
	Calcium Type L (DHP Site)	Rat	25 uM
	Glutamate, NMDA, Agonist Site	Rat	25 uM
	Nicotinic [α -Bungarotoxin Sensitive, Neu	Rat	25 uM
	Potassium, hERG	Human	25 uM
	Sodium Site 2	Rat	25 uM
Kinases	Kinase, ABL	Human	25 uM
	Kinase, AKT1	Human	25 uM
	Kinase, AurA	Human	25 uM
	Kinase, CHK1	Human	25 uM
	Kinase, CK1d	Human	25 uM
	Kinase, Erk1	Human	25 uM
	Kinase, FYN	Human	25 uM
	Kinase, GSK3b	Human	25 uM
	Kinase, LYN	Human	25 uM
	Kinase, MARK1	Human	25 uM
	Kinase, MAPKAPK2	Human	25 uM
	Kinase, MAPKAPK5	Human	25 uM
	Kinase, MET	Human	25 uM
	Kinase, MSK1	Human	25 uM
	Kinase, PKA	Human	25 uM
	Kinase, PKC ζ	Human	25 uM
	Kinase, PKD2	Human	25 uM
	Kinase, SRC	Human	25 uM
	Kinase, AKT2	Human	25 uM
	Kinase, BTK	Human	25 uM
	Kinase, CK2	Human	25 uM
	Kinase, InsR	Human	25 uM
	Kinase, IRAK4	Human	25 uM
	Kinase, IKKa	Human	25 uM
	Kinase, LCK	Human	25 uM
	Kinase, SGK 1	Human	25 uM
	Kinase, TIE2	Human	25 uM
	Kinase, ZAP	Human	25 uM
Nuclear Receptor	Bile Acid Nuclear Receptor	Rat	25 uM
	Bile AcidNuclear Receptor	Human	25 uM
	Constitutive Active/Androstane Receptor	Human	25 uM
	Constitutive Active/Androstane Receptor	Rat	25 uM
	Estrogen	Bovine	25 uM
	Estrogen	Human	25 uM

	Estrogen ERalpha	Rat/Mouse	25 uM
	Glucocorticoid	Human	25 uM
	Liver X	Rat	25 uM
	Liver X	Human	25 uM
	Mineralcorticoid	Rat	25 uM
	Mineralcorticoid	Human	25 uM
	Peroxisome Proliferator-Activated Receptor	Rat	25 uM
	Peroxisome Proliferator-Activated Receptor	Human	25 uM
	Pregnane X Receptor	Human	25 uM
	Pregnane X Receptor	Rat	25 uM
	Progesterone	Bovine	25 uM
	Progesterone	Human	25 uM
	Retinoic (or X)	Rat	25 uM
	Retinoic (or X)	Human	25 uM
	Testosterone, Cytosolic	Human	25 uM
	Testosterone, Cytosolic	Rat	25 uM
	Thyroid Hormone	Rat	25 uM
	Thyroid Hormone	Human	25 uM
Phosphatases	Phosphatase, CD45	Human	25 uM
	Phosphatase, VHR	Human	25 uM
	Phosphatase, PP2C	Human	25 uM
	Phosphatase, PTPmu	Human	25 uM
	Phosphatase, PP2B	Human	25 uM
	Phosphatase,PTPN11	Human	25 uM
	Phosphatase,PTPN13	Human	25 uM
	Phosphatase,PTPN14	Human	25 uM
	Phosphatase, PP1a	Human	25 uM
	Phosphatase, PP2a	Human	25 uM
	Phosphatase, PTP1b	Human	25 uM
	Phosphatase, PTP-TC	Human	25 uM
	Phosphatase, MEG1	Human	25 uM
	Phosphatase, MEG2	Human	25 uM
	Phosphatase, PEST	Human	25 uM
	Phosphatase, LMPTP-A	Human	25 uM
	Phosphatase, SHP-1	Human	25 uM
	Phosphatase, PTPbeta	Human	25 uM
	Phosphatase, LAR	Human	25 uM
Transporters	Adenosine Transporter	Rat	25 uM
	Dopamine Transporter	Rat	25 uM
	Norepinephrine Transporter	Rat	25 uM
	Serotonin Transporter	Rat	25 uM
	Adenosine Transporter	Human	25 uM
	Norepinephrine Transporter	Human	25 uM
	Vesicular Monoamine Transporter	Rat	25 uM
	Dopamine Transporter	Human	25 uM
	Serotonin Transporter	Human	25 uM
Other Enzymes	Acetylcholine Esterase	Human	25 uM
	Acetylcholine Esterase	Rat	25 uM
	Caspase - 1	Human	25 uM
	Caspase - 2	Human	25 uM
	Caspase - 3	Human	25 uM

	Caspase - 4	Human	25 uM
	Caspase - 5	Human	25 uM
	Caspase - 8	Human	25 uM
	Caspase - 10	Human	25 uM
	Catechol-O-Methyl Transferase	Rat	25 uM
	Cox - 1	Ram	25 uM
	Cox - 2	Sheep	25 uM
	Elastase	Human	25 uM
	Esterase - Plasma	Human	25 uM
	Matrix Metalloprotease - 1	Human	25 uM
	Matrix Metalloprotease - 2	Human	25 uM
	Matrix Metalloprotease - 3	Human	25 uM
	Matrix Metalloprotease - 7	Human	25 uM
	Matrix Metalloprotease - 13	Human	25 uM
	Matrix Metalloprotease - 9	Human	25 uM
	Monoamine Oxidase A, Central	Rat	25 uM
	Monoamine Oxidase A, Peripheral	Rat	25 uM
	Monoamine Oxidase B, Central	Rat	25 uM
	Monoamine Oxidase B, Peripheral	Rat	25 uM
	Nitric Oxide Synthase, (Neuronal)	Rat	25 uM
	Secretase, Beta	Human	25 uM
	Tetrahydrofolate Reductase	Porcine	25 uM
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PHYLONIX	50% Lethal Concentration Assay (LC50)	Zebrafish	5 point concentration response up to 1000 uM
	Developmental Toxicity: endpoints measured include heart rate, circulation, heart edema, trunk edema, hemorrhage, head size, brain necrosis, jaw malformation, tail malformation, liver necrosis, intestine malformation, motility, body length.	Zebrafish	1 concentration (LC0)
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NCGC	nuclear receptor trans-activation assays		>10 point concentration response
	Androgen receptor (AR)	Human	
	Estrogen receptor alpha (ER α)	Human	
	Farnesoid X-activated receptor (FXR)	Human	
	Glucocorticoid receptor GR)	Human	
	LXR beta	Human	
	PPAR delta	Human	
	PPAR gamma	Human	
	Retinoid X receptor alpha (RXR α)	Human	
	Thyroid hormone receptor beta	Human	
	Vitamin D receptor (VDR)		
	additional nuclear receptor assays in development	Human, Mouse and Rat	